**\*\*Park Name**

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| [Devils Postpile National Monument](http://www.nps.gov/depo/) |

**\*\*Lesson Plan Title (255 characters maximum)**

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| --- |
| Exploring Climate Science: Stream Flow Tools and Data |

**\*\*Essential Question and Quick Lesson Description**

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| In “Exploring Climate Science (Streamflow Tools and Data),” students will use data to draw conclusions about climate change. The students will be able to:1. Create a double line graph to show the changes in streamflow throughout the year2. Make two predictions about how climate change may affect stream flows |

**\*\*Lesson Grade Level: (Check One of the following)**

\_\_\_ Lower Elementary: Pre-Kindergarten through 2nd Grade

\_X\_ Upper Elementary: 3rd Grade Through Sixth Grade

\_\_\_ Middle School: Sixth Grade Through Eighth Grade

\_\_\_ High School: Ninth Grade through Twelfth Grade

\_\_\_ College Undergraduate Level

\_\_\_ Graduate Level (Masters, PhD)

\_\_\_ Adult Education

**\*\*Lesson Subject: (Check As Many as Apply)**

\_\_ Social Studies

\_\_\_ Math

\_x\_ Science

\_\_\_ Literacy and Language Arts

\_\_\_ Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Feature Image for Lesson**

**This will be shown next to your lesson on the Education Portal. Provide filename and location below.**

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| In folder |

**Alt Text for Feature Image**

**If the image does not display, what description do you want to appear in its place?**

|  |
| --- |
| The San Joaquin River flows through willows. |

**\*\*Common Core Standards:**

**Want more information about Common Core? Go to [http://www.corestandards.org/](http:///h)**

|  |
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| Grade Level: 3-5 Subject Area: Science RI.5.7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.RI.5.9: Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. W.5.8:Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. W.5.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.  |

**\*\*State Standards:**

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**Additional Standards(s) (255 characters maximum): Does this lesson meet additional standards?**

**e.g. Next Generation Science Standards, National Council for Social Studies Standards, Advanced Placement (AP) Courses, International Baccalaureate (IB) Courses, Next Generation Science Standards**

|  |
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| Next Generation Science Standards: 5-ESS2-2, 5-ESS3-1 |

**Thinking Skills (Check As Many as Apply)**

The thinking skills listed below are based on Bloom’s Taxonomy. Consider your lesson procedure and activities. Then check off the thinking skills that students will experience through your lesson.

X **Knowledge** – Recalling or recognizing information ideas, and principles

X **Comprehension** – Understand the main idea of material heard, viewed, or read. Interpret or summarize the ideas in own words.

X **Application** – Apply an abstract idea in a concrete situation to solve a problem or relate it to a prior experience.

X **Analysis** – Break down a concept or idea into parts and show the relationships among the parts.

\_\_\_ **Creation** – Bring together parts (elements, compounds) of knowledge to form a whole and build relationships for NEW situations.

\_\_\_ **Evaluation** – Make informed judgments about the value of ideas or materials. Use standards and criteria to support opinions and views.

**Complete Lesson File**

**Is there a downloadable file (or PDF) for this lesson plan? If yes, provide filename and location:**

**Be sure your PDF or other file meets universal accessibility requirements, most PDFs do not.**

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**Lesson Duration**

 **Time to complete this lesson plan in minutes (25 characters maximum)**

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| 60 minutes |

**\*\*Background Information for Teacher**

**What important content, contextual, or practical information and background knowledge does the teacher need to successfully implement this lesson?**

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| Water is essential for life on Earth. Relative water availability is a major factor in designating habitats for different living organisms. In the United States, things like agriculture and water rights are hot topics. Current models predict that average global temperatures are going to continue to rise even if regional climate changes remain complex and varied. These changes will have an impact on all of Earth's systems.Studies have shown that climate change is driven not only by natural effects but also by human activities. Knowledge of the factors that affect climate, coupled with responsible management of natural resources, are required for sustaining these Earth systems. Long-term change can be anticipated using science-based predictive models, making science and engineering essential to understanding global climate change and its possible impacts.National Parks can serve as benchmarks for climate science trends and effects over time because they are protected areas void of human influence. Understanding current climate trends will help set students up to be successful in interpreting and engaging in discussions about climate change, which will lead to informed decision making. |

**\*\*Important Vocabulary and Terms with Definitions:**

**What terms and academic language will students have to know to participate in the lesson? Lessons typically include 5 to 15 terms and definitions.**

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| 1. Stream flow—the flow of water in streams and rivers often from snowpack runoff.
2. Watershed – an area of land where all of the water that is under it or drains off of it goes into the same place.
3. Peak flow—the maximum flow of water in a river or stream in a given year.
 |

**\*\*Lesson Preparation: What preparation does the teacher need to do before the lesson? What supplies or materials should be gathered?**

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| Make copies of the student materials Streamflow Data and Worksheet 6.1. for each group. (See Materials Section)Gather the following supplies: 1. Graph paper
2. Markers
 |

**\*\*Lesson Hook or Preview: What activity, video, song, or other experience could get the students excited about the lesson and thinking about the topic? Is there a way to make the lesson important to their lives or link the lesson content to what they already know?**

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| Explain that scientists measure water flow to track climate changes just like they measure snow water equivalent. Pre-teach vocabulary: stream flow, peak flow, water level. Additionally review **double line graph** and **bar** **graph** if necessary. |

**\*\*Procedure: List the instructions the teacher should follow as Step One, Step Two, Step Three, etc.**

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| STEP 1: 1. Have students make predictions about what impacts stream flow.
2. Show hydrology podcast from CD (or download from materials section or [website](http://www.nps.gov/depo/forteachers/learning/videos-and-other-resources.htm)) so students can observe how scientists measure stream flow.

STEP 21. Explain to students that they will be graphing the stream flow from Pohono Bridge in Yosemite Valley. Model creating a double line graph using data from 2009 & 2010 (see procedure 6.1). Then, facilitate a discussion of the graph.
	1. *When is peak flow?*
	2. *How are water levels different for 2009 & 2010?*
	3. *Why is the most water released in May/June?*
2. Have students create a double line graph using data from 2011 & 2012, then record two thing they notice about their graphs in relation to streamflow (on sticky notes or on the graph itself). Share observations.
3. Talk about how streamflow can give us information about climate change.
	1. *Measuring stream flow can give scientists a good idea of how much the snowpack is melting on a specific day or month.*
	2. *Due to climate change the peak stream flow could beg*in *to occur sooner in the year. This could have the potential to throw many natural systems off and could negatively impact the water availability for human use.*
4. Tell students that scientists began measuring stream flows from the stream in 1960.
	1. *Ask: how do you think streamflow has changed over time?*
	2. *If necessary direct student thinking…peak stream flow might occur earlier because snow melts earlier due to warmer temperatures, etc.*
5. Show students graph of decade averages from 1960 – 2010 (Worksheet 6.1). Talk about what the graph shows. Emphasize the importance of continuing to record information so scientists can see changes over time.
 |

**\*\*Assessment: How can teachers tell that each individual student has met the objective? How will teachers see if each student knows the answer to the essential questions or has mastered the skills? Below, include below a brief description of how to use the assessment. Later in this template you are provided with the opportunity to upload a digital copy of the assessment for teachers to print and use.**

|  |
| --- |
| Discussion: Why is monitoring streamflow important? Think about what streamflow might tell us about peak flows, water levels, climate change, etc. |

**Lesson Materials: Any worksheets, photos, primary source, scientific data, maps, graphic organizers, or PowerPoint ‘s should be described and attached using the template below. Please create additional materials boxes if necessary.**

**Material #1**

**Title (255 characters maximum):**

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| [Streamflow](http://www.google.com/url?q=http%3A%2F%2Fwww.nps.gov%2Fdepo%2Fforteachers%2Fclassrooms%2Floader.cfm%3FcsModule%3Dsecurity%2Fgetfile%26pageID%3D649265&sa=D&sntz=1&usg=AFQjCNEFLZIP4iQYXN38NDMuRklp980Pyw) [data from Pohono Bridge in Yosemite Valley from 1960-2013 (Provided as downloadable file)](http://www.nps.gov/depo/forteachers/classrooms/loader.cfm?csModule=security/getfile&pageID=649265) |

**Summary (how does the material function in the lesson?):**

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| --- |
| This file provides data from Pohono Bridge in Yosemite Valley. Students will use this data to draw conclusions about climate change. |

**Downloadable file of this material in original format if possible, such as Microsoft word or PowerPoint (Provide filename and location)**

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**Material #2**

**Title (255 characters maximum):**

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| Worksheet 6.1: Vocabulary review |

**Summary (how does the material function in the lesson?):**

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| This file will familiarize students with basic vocabulary for the lesson |

**Downloadable file of this material in original format if possible, such as Microsoft word or PowerPoint (Provide filename and location)**

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**Material #3**

**Title (255 characters maximum):**

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| [Hydrology Podcast](http://www.nps.gov/depo/forteachers/learning/videos-and-other-resources.htm) |

**Summary (how does the material function in the lesson?):**

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| --- |
| This video will introduce students to hydrologic measurements and why monitoring hydrology is important for researchers studying climate science. |

**Downloadable file of this material in original format if possible, such as Microsoft word or PowerPoint (Provide filename and location)**

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**Assessment Materials**

**How can teachers tell that each individual student has met the objective? How will teachers see if each student knows the answer to the essential questions or has mastered the skills? Attach below the assessment and, if applicable, a rubric or answer key.**

**Assessment**

**Title (255 characters maximum):**

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**Summary (how does the material function in the lesson?):**

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**Downloadable file of this material in original format if possible, such as Microsoft word or PowerPoint (Provide filename and location)**

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**Assessment Rubric or Answer Key**

**Title (255 characters maximum):**

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| N/A |

**Summary (how does the material function in the lesson?):**

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**Downloadable file of this material in original format if possible, such as Microsoft word or PowerPoint (Provide filename and location)**

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**Supports for Struggling Learners**

**If a learner is struggling to understand the objective, essential question, or skills presented in the lesson, what can be done to help this learner? Is there a lower reading level version of text? Is there a more image heavy or simplified version of content? Can supportive devices be provided such as calculators?**

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| N/A |

**Extensions for Excelling Learners**

**If a learner is really excelling at the objective and skills presented in the lesson, what can be done to continue to challenge this learner? Can the student create a product or learn more in depth about the content?**

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| N/A |

**Additional Resources**

**Please list websites, references, or other materials for further research by interested students that is not already provided within the lesson.**

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**Related Lessons or Educational Materials**

**Is this lesson connected to other lessons within a unit? Is this lesson related to a field trip guide or activity? If so, list the website address or titled of these other materials below.**

|  |
| --- |
| Day 1- [Earth as a System](http://www.nps.gov/depo/forteachers/classrooms/earth-as-a-system.htm)Day 2- [Weather vs Climate](http://www.nps.gov/depo/forteachers/classrooms/weather-vs-climate.htm)Day 3- [Watershed](http://www.nps.gov/depo/forteachers/classrooms/watersheds.htm)Day 4- [Climate Science Data and Tools](http://www.nps.gov/depo/forteachers/classrooms/climate-science-data-and-tools.htm)Day 5- [Field Trip](http://www.nps.gov/depo/forteachers/classrooms/field-trip.htm)Day 6- [NPS Connections](http://www.nps.gov/depo/forteachers/classrooms/nps-connect.htm)Day 7- [Project Preparation](http://www.nps.gov/depo/forteachers/classrooms/project-preparation.htm)Day 8- [Evaluations](http://www.nps.gov/depo/forteachers/classrooms/presentations.htm) |